NMWG
Network Metrics for Grid Applications and Services

Draft Discussion

Monday, Feb 18, 2002

1

Purpose of Document

- Describe metrics of interest to community
- Information about techniques used for measurement
- Mapping of Tools <-> Metrics

- Define dictionary of terms
- Parameters used for each metric
- Discuss issues in acquiring and using measurements

2

Metrics and Measurements

- Metric
  - Following IETF IPPM RFC 2330 Terminology
  - Characteristic, not an observation of a characteristic
  - Natural quantity, not “performance of X app”
  - Example: link capacity
- Measurement
  - an observation of a metric.
  - multiple ways to measure a given metric.
  - Measurements may be either “raw” or “derived”
- Why the distinction?
  - Develop hierarchy
  - Improves portability
    - easier to define which measurements are useful
  - Our job to catalog, not define “right way” to measure

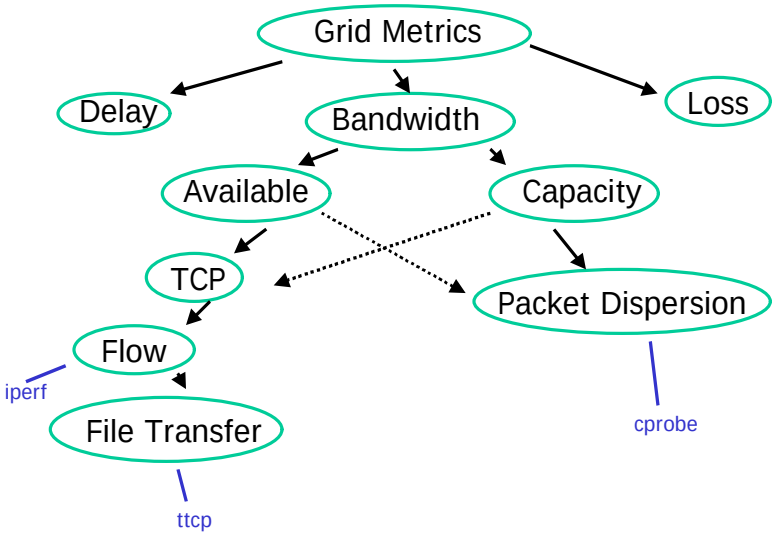
3

Evolution of the Document

- We will judge success by interoperability
  - Exact method may vary
  - First step is creating “type system”
- Cannot enumerate all tools or measurements
  - Always in development
  - **We don’t define measurements**
  - **We don’t approve “standard” measurements**
- Document will establish framework for metric schemas and organization
- Tools & measurements lists will be maintained online

4

Goal: Annotated Hierarchy/Relations



5

Statistical Representations

- Sampling Techniques
- Singleton: single observation of a measurement
- Sample: series of measurements
  - Sampling techniques:
    - Periodic intervals, begin each observation at a consistent interval
    - Aperiodic intervals, typically distributed according to a Poisson or geometric distribution
    - many more…
- Variability

6

Bandwidth Metrics

- Capacity: The maximum bandwidth a path can provide to an application when there is no competing traffic load (cross traffic)
- Availability: The maximum throughput that the path can provide to an application, given the path's current cross traffic load.
- Utilization: The aggregate bandwidth currently used by all applications on that path.

- For each of these, would like:
  - End to End
  - Hop by hop

7

Delay Metrics

- One-way delay
- Roundtrip delay
- Delay jitter

8

Which Parameters

To build dictionary, need to identify important parameters

- TCP
  - Tahoe/Reno/New Reno
  - Very many variants in different OS releases
  - Bitflag: slow start, AIMD, Fast Retrans, Fast Recov
  - Kernel version

9

Building a Measurement Schema

Bandwidth

- Parameters
  - Source & Destination
  - Source & Destination OS and software
- Data
  - Time range of measurement
  - Bandwidth

TCP Throughput

- Parameters
  - TCP State
- Data
  - Data length

TCP File Transfer

- Parameters
  - TCP State
  - Data length
- Data

Packet Dispersion

- Parameters
  - # Packets
  - Length each P
- Data
  - Arrival each P

10

Measurement Tools

- Suggestion: Build a web page summarizing current tools relevant to the Grid community
- Example:
  - Tool: iperf
  - Metrics: available bandwidth, jitter (in UDP mode)
  - Pros:
  - Cons:
  - Related tools: ttcp, nettest

11

Next Steps

- Finish list of metrics / definitions
  - Volunteers needed
- Work on document
  - Volunteers needed
- Start tool categorization
  - Volunteers needed

12